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Session G12 - Planar Tunneling and Spin Sensitive Devices.

MIXED session, Tuesday morning, March 21

103E, MCC

[G12.14] Transport Properties of Nonequilibrium Superconductivity Induced by Spin-Polarized Quasiparticles in Perovskite Ferromagnet-Insulator-Superconductor (F-I-S) Heterostructures

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Our recent studies of the critical currents and quasiparticle tunneling spectroscopy of perovskite F-I-S and N-I-S (N: non-magnetic metal) heterostructures have revealed evidence of pair-breaking in superconducting cuprates due to the injection of spin-polarized quasiparticle currents. A pulsed current technique has been employed in the transport studies of these heterostructures to minimize thermally induced suppression of superconductivity. To better quantify the nonequilibrium effects in cuprate superconductors, the transmittivity of spin-polarized quasiparticles from F to S and the efficiency of Cooper pair breaking per spin-polarized quasiparticle are investigated as a function of the temperature and insulating barrier thicknesses. We find that near T_c , the transmittivity increases approximately linearly with the temperature, and the efficiency appears non-monotonic in temperature, possibly due to competing effects, such as decreasing spin polarization and increasing spin-polarized quasiparticle energy relative to the average superconducting gap, with increasing temperature. The spin diffusion length is also estimated as a function of temperature from transport studies of F-I-S heterostructures with different sample dimensions.

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